Scientific Inquiry

3-1 The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

3-1.3 Generate questions such as "what if?" or "how?" about objects, organisms, and events in the environment and use those questions to conduct a simple scientific investigation.
Taxonomy Level: 6.1-B and 3.2-B Create and Apply Conceptual Knowledge

Previous/Future knowledge: In 1st grade (1-1.3), students carried out simple scientific investigations when given clear directions. In 2nd grade (2-1.1), students carried out simple scientific investigations to answer questions about familiar objects and events. Students will make a prediction and compare results in 3-1.4. In 5th grade (5-1.1), students will identify questions suitable for generating a hypothesis. In 7th grade (7-1.2), students will generate questions that can be answered through scientific investigations. In 8th grade (8-1.4), students will generate questions for further study on the basis of prior investigations.

It is essential for students to create their own questions through exploration, observations, or just curiosity about objects, organisms, and events in the environment. These questions can ask things such as "what", "when", "where", "why" or "how". Not all of these questions lead to scientific investigations, but they may be used to gain information that would then lead to a testable question. A *testable question* is one in which an experiment is needed to find the answer.

Testable questions will then be used to conduct a simple scientific investigation such as:
- *What if* an object is pushed with different strengths?
- *What if* plants were watered with salt water?
- *What* affects the time it takes ice to melt?
- *How* does changing the length of an instrument string affect its pitch?
- *How* does camouflage help an animal survive in its habitat?

NOTE TO TEACHER: Not all questions are scientific questions that can lead to a scientific investigation. Questions such as "What is a plant?" or "How far away is the Sun?" do not lend themselves to the steps involved in conducting simple scientific investigations. The type of investigation will vary depending on the question being asked.

Steps for conducting a simple scientific investigation may be:
- Ask the question to be investigated
- Make a prediction (possible answer to the question)
- Decide what materials are needed for the experiment
- List steps to carry out the experiment that will test (change) only one factor or relationship; all other factors must be kept the same.
- Record observations and organize the data as the experiment is carried out
- Communicate the results or infer meaning from the data

NOTE TO TEACHER: Students can record data in prepared charts, tables, and graphs in order to make it easier to explain the results.

It is not essential for students to identify variables as manipulated or responding variables, but the term "variable" might be introduced as a factor that is changed in the investigation.

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Assessment Guidelines:

The objective of this indicator is to *generate* questions such as "what if?" or "how?" about objects, organisms, and events in the environment; therefore, the primary focus of assessment should be to create or devise appropriate questions for a simple scientific investigation. However, appropriate assessments should also require students to *identify* an appropriate question that could be investigated.

Another objective of this indicator is to *use* generated questions to conduct a simple scientific investigation; therefore, the primary focus of assessment should be to apply carry out investigation procedures that answer the question. However, appropriate assessments should also require students to *predict* the outcome of an investigation; *identify* appropriate tools for an investigation; *identify* appropriate steps needed to answer a question; *identify* observations related to an investigation; or *infer* (or draw conclusions) from the results of an investigation.